Movement Patterns of Tournament Released Largemouth Bass (*Micropterus salmoides*): A Brief Meta-Analysis

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Summary

A meta-analysis of published studies from rivers and lakes indicate that it is unlikely that the majority of largemouth bass (*Micropterus salmoides*) released from “release boats” following tournaments return to their distant stream of capture. The lack of return could result in local depletion of populations from tributaries beyond 30 km (or 20 miles) of the release of largemouth bass, if those tributaries were fished by tournament anglers. Moreover, this could also result in relatively high local populations near release sites. In order to prevent local depletion of populations in nearby tributaries, on-site “catch-and-release” practices or “off-limits fishing sanctuaries” may be implemented for targeted streams. Currently, the on-site “catch-and-release” of individuals less than 15 inches in total length is practiced throughout the Chesapeake Bay watershed during the spawning season of largemouth bass. Similar strategies are also implemented in Pennsylvania and New Jersey during the spawning season of Largemouth Bass. This management tool helps maintain larger spawning populations in local tributaries and should be continued. Following tournament or recreational catches, anglers should be encouraged to return their fish to the stream of capture. If this is not possible, then release sites should be well-chosen and may be alternated among rivers. High densities of individuals near release sites may result in greater competition for resources or otherwise reduce fitness of individuals. While release sites may be alternated among rivers, this does not ensure that adults will return to their home stream or that adults are released to good habitats. Black bass should be returned near their stream of capture, but four well-chosen, prime release sites are herein reported for upper bay tournaments.

*Review of movement studies on black bass (*Micropterus *spp.)*

As early as Funk (1957), largemouth bass (*Micropterus salmoides*) were reported to maintain relatively small home ranges, with a few individuals traveling long distances. These small home ranges may be defined by contours in the substrate (Hubert and Lackey (1980). These contours may be important for largemouth bass when navigating home after displacement. An individual largemouth bass may move long distances because of storm events, water temperature and spring spawning events (Todd and Rahen 1989), or human-related activities such as fishing tournaments.

During fishing tournaments, largemouth bass can experience numerous problems such as increased physiological stress and barotraumas (Gravel and Cooke 2008), which may hinder nest-guarding behaviors of males during spring (Cooke et al. 2000). In addition to these physiological and ethological issues, largemouth bass are redistributed because they are removed from their home tributaries, carried to weigh-in sites, and ultimately released in batches at tournament-selected locations. Whether the fish return to their home tributaries has been a focus of research for many years. The probability of movement following such releases has been intensively studied in both lakes and rivers, including the Chesapeake Bay watershed (Siebold 1991; Richardson-Heft 2000). If fish do not return to their stream of capture, then those stream populations may become locally depleted after fishing events. The objectives of this meta-analysis are: 1) to report on the current status of knowledge related to re-distribution of largemouth bass following batch release of tournaments; and 2) to suggest possible management options and studies that may improve tournament release practices.

In the Northeast and Susquehanna Rivers of the Chesapeake Bay, Richardson-Heft et al. (2000) reported that after displacement, largemouth bass generally remained at the new site for at least 1 week. After one week, most fish stayed in the area they were transported to, with little less than half returning to their area of capture. Notably, Richardson-Heft et al. (2000) did not examine whether fish moved to their original stream of capture. Siebold (1991), however, noted that slightly more than half returned to area of their capture in the Potomac River. In the Hudson River, Stang et al. (1996) reported very little evidence for returning to a home stream (or philopatry), with only 8 of 42 tagged fish returning to their original stream of capture following displacement. It took from 2 to 22 weeks for fish to return to their original stream of capture. Similarly, in the Grand River (Ontario, Canada), only 5 of 14 displaced smallmouth bass (*Micropterus dolomieu*) returned to their stream of capture, which took approximately 1 month (Ridgway 2002). Such patterns are also evident in lakes and reservoirs. In Rideau Lake (Ontario), of 19 largemouth bass that were displaced up to 16.5 km, only 4 returned to streams of capture, which took approximately 1 – 4 weeks (summer). In summary, displaced fish remain within 0 – 1 km of their release site for approximately 1 – 4 weeks (Richardson-Heft et al. 2000; Ricks 2006); most appear to remain within 3 km of their release site for longer periods of time (Ricks 2006).

While adult black bass (*Micropterus* spp.) are capable of traveling long distances (Funk 1957; Siebold 1991; Stang et al. 1996; Ridgeway 2002), most maintain small home ranges, even after being displaced (Lewis and Flickinger 1967; Pribyl et al. 2005). Distance traveled within a stream is generally less than 0.1 km in both rivers and lakes (Lewis and Flickinger 1967; Winter 1977; Pribyl et al. 2005), but home ranges tend to be

slightly larger for tidal rivers of the Chesapeake Bay (Siebold 1991; Richardson-Heft et al. 2000) and can be as high as 2 km^2 or less than 1 mi^2 (Siebold 1991). Relatively small home ranges could explain naturally high levels of genetic divergence and local adaptation of populations among rivers and lakes (Meador and Kelso 1990; Borden 2008). Even though movement may be restricted to within a small home range, some fish exhibit higher levels of movement (Richardson-Heft et al. 2000; Pribyl et al. 2005; Ricks 2006), especially when they are displaced from their original stream of capture (Richardson-Heft 2000; Ridgway 2002). This is likely because for some fish, the release sites may not be optimal or familiar habitats. The absence of submerged cover or high salinities (>5 ppt) could elicit movement away from the release site (Hubert and Lackey 1980; Meador and Kelso 1989). This is especially so if the stream of capture for the largemouth bass was essentially freshwater (Meador and Kelso 1989). Largemouth bass spending their life in freshwater apparently differ in tolerance to salinity levels, in growth patterns, and in body condition when compared to largemouth bass raised in brackish water (Meador and Kelso 1989, 1990). Thus, individuals that are locally (and possibly genetically; Borden 2008) adapted to their home stream could behave differently when displaced. Adults reared in freshwater may be more likely to leave a brackish release site than adults reared in brackish water.

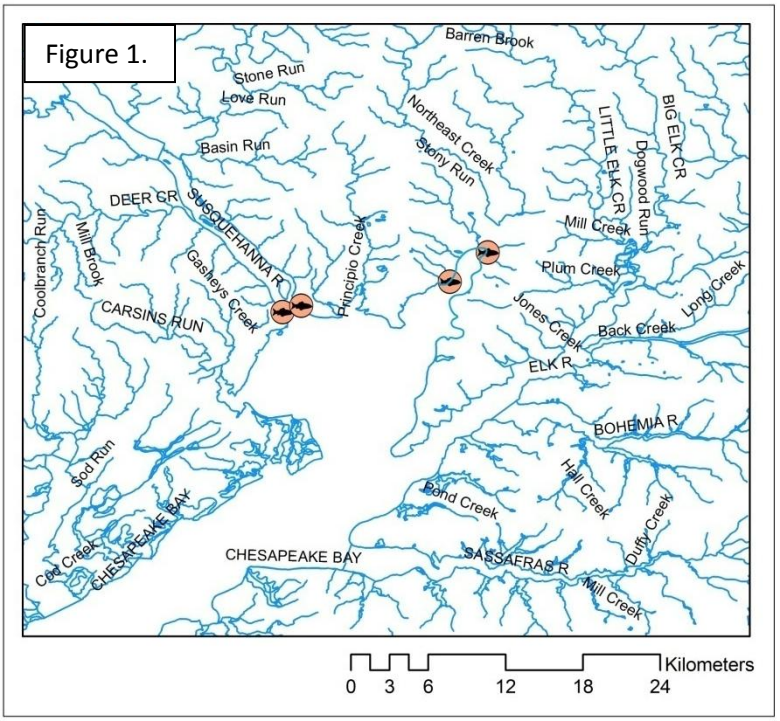
In summary, release of batches of fish following tournaments can result in relatively high density levels at release sites for at least 1 week. Hence, release areas (or streams or rivers) may maintain disproportionately high populations of largemouth bass. It is not known why fish leave the release site area, or if there are any fitness costs to remaining in these areas. Some fish may return to their stream of capture, but

it is unlikely they will return unless those streams are within 30 km of the release site. In the Grand River (Ontario), the maximum distance traveled for a single displaced smallmouth bass was 84 km, while most displaced fish traveled less than 26 km (Bunt et al. 2002). Largemouth bass generally move much smaller distances (Pribyl et al. 2005). For comparison, the maximum distance traveled for a fish tagged and released within their stream of capture was approximately 10 km within the Potomac River (Siebold 1991).

Management Considerations

In order to maintain local populations of black bass in tributaries of the Chesapeake Bay:

1) Once captured and weighed, the fish should be returned either to their home stream, or at least within 30 km (or 20 miles) of their original stream of capture
2) To maximize survivorship and reproductive ability of tournament-caught fish, black bass should be returned to habitats that are considered “prime” locations by the tidal bass survey team of Maryland Department of Natural Resources. For the upper bay (Fig. 1), these locations include (but are not limited to):
    a. Northeast River: 39° 34’ 22.195”, 75° 58’ 12.513”



b. Northeast River: 39° 35’ 22.882”, 75° 56’ 49.721”

c. Susequehanna River: 39° 33’ 5.314”, 76° 5’ 24.133”

d. Susequehanna River: 39° 33’ 14.477”, 76° 4’ 39.3”

Gilliland et al. (2002) similarly suggested in their Guidebook for Anglers and Tournament organizers that fish should be released to good release sites, which included those away from boat traffic, over firm substrate, those with relatively cool water, and those in or near deep water. The tidal bass survey team for Maryland Department of Natural Resources has identified such sites using additional habitat criteria for many habitats of the upper Bay and other surveyed rivers in the Chesapeake Bay watershed. For further examples, or more information on the criteria used for assessing a prime habitat, please contact Joseph W. Love (jlove@dnr.state.md.us).

3) To protect small populations from becoming locally depleted, identify freshwater streams for protection using either “catch-and-release at site of capture only” or “no-fishing” policies

In order to mitigate the impacts of tournament-angling on the populations of black bass, the following questions are recommended for study:

1) Is the nutritional status of largemouth bass lower at high density, tournament release sites than at other sites?
2) Do fish move less from prime release habitats than marginal release habitats?
3) Does recruitment decline in years with increasing numbers of black bass caught and released during spring tournaments?

4) Are stream sanctuaries during the spawning season beneficial to juvenile production?

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